



National Aeronautics and
Space Administration

September 19, 1997

NRA-97-MTPE-10

RESEARCH ANNOUNCEMENT

SOLID EARTH AND NATURAL HAZARDS RESEARCH AND APPLICATIONS

Proposals due November 19, 1997
Email letters of intent due October 17, 1997

OMB Approval No. 2700-0087

**SOLID EARTH AND NATURAL HAZARDS
RESEARCH AND APPLICATIONS**

**NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
November 19, 1997**

**NRA 97-MTPE-10
Issued September 19, 1997**

**Office of Mission to Planet Earth
National Aeronautics and Space Administration
Washington, DC 20546**

RESEARCH AND APPLICATIONS IN SOLID EARTH SCIENCES AND NATURAL HAZARDS

This announcement presents an opportunity for researchers to participate in the National Aeronautics and Space Administration (NASA) research and development themes of Solid Earth and Natural Hazards Research and Applications in Appendix A. The research themes aim to develop and apply NASA space geodetic and remote sensing technology in the solution of important scientific problems which improve our understanding of the dynamics of the solid earth (including the interaction with atmosphere, ocean and fluid core) and which demonstrate or disseminate this technology in ways that are important to society, especially in the assessment and mitigation of natural hazards.

NASA's Mission to Planet Earth (MTPE) is studying how our global environment is changing. Using the unique perspective available from space, NASA is observing, monitoring and assessing large-scale environmental processes, with an emphasis on climate change. MTPE satellite data, complemented by aircraft and ground data, are enabling us to better understand environmental changes, to determine how human activities have contributed to these changes, and to understand the consequences of such changes. MTPE data, which NASA is distributing to researchers worldwide, are essential to humans making informed decisions about protecting their environment. Participation in this program is open to all categories of organizations, both domestic and foreign: educational institutions, other nonprofit organizations, NASA centers, industry, and other Government agencies. Proposals may be submitted at any time during the period ending **November 19, 1997**, but not later than 4:30 p.m. e.s.t. on that date. Proposals received after that date will be returned unless it is determined to be in NASA's best interests to evaluate the proposal. Proposals will be reviewed during December, 1997-February 1998. Announcements regarding selection for funding in Fiscal Year (FY) 1998 will be made in March, 1998.

Details relevant to this solicitation are included in the Appendices to this Announcement. Appendix A provides scientific, technical and program information for the themes in which proposals are sought. Appendix B provides information regarding sources of existing data and means of acquiring new data. Appendix C contains the basic guidance necessary for preparation of proposals in response to this NASA Research Announcement (NRA). Appendix D contains instructions for preparation of proposals in response to NASA Research Announcements. Appendix E contains formats and forms required for proposals submitted in response to this NRA.

This NASA Research Announcement (NRA) will serve as the vehicle for soliciting research in areas of Solid Earth, Natural Hazards, and Geologic and Archeologic Applications and the development of supporting technology. We anticipate that the Solid Earth and Natural Hazards research and applications areas in NASA will issue a modified version of this solicitation annually, which will include flight project science team opportunities as well, when appropriate. A summary of currently supported research projects may be found at the following web site: (<http://www.hq.nasa.gov/office/mtpe/nraselections.html>).

New focus areas reflected in this NRA include geomagnetic studies which make use of past and future space-flight projects, studies which can develop methods to extract mass flux information from time variable gravity and other geodetic data, and applications of remote sensing to archeological problems. We recommend that the proposer carefully review this document before submitting a proposal. Failure to follow the guidelines outlined here may result in the proposal

being ineligible for funding through this NRA in FY 1998.

We estimate that the NASA funding level for the Solid Earth and Natural Hazards Research and Applications programs in FY 1998 will be approximately \$20 million, much of which is previously committed. NASA anticipates approximately 10-40 new-start awards, with annual budgets in the \$50,000.00-\$200,000.00 range and nominal award durations of three years (subject to annual review). The selection of any proposal is contingent on the availability of FY 1998 funds. This announcement and appendices are available on the Office of Mission to Planet Earth World Wide Web. The URL is: <http://www.hq.nasa.gov/office/mtpe/> (Office of Mission to Planet Earth; look under "MTPE Research Announcements")

The following items apply only to this Announcement:

Identifier: **NRA 97-MTPE-10**
Proposals Due: **November 19, 1997**
Copies Required: 10

Email Letters of Intent: Due: October 17, 1997
email message to: cwilson@hq.nasa.gov
subject: MTPE-10
text: PI Last Name, First Name
PI email address
Institution Name
Brief Title (75 characters or less)
Program Area (from list on E-2)

Submit All Proposals to: Solid Earth and Natural Hazards NRA
(**NRA 97-MTPE-10**) Code Y
400 Virginia Avenue, Suite 700
Washington, DC 20024
(For overnight delivery purposes only,
the recipient telephone number is 202-554-2775)

Selecting Official: Director, Science Division
Office of Mission to Planet Earth

Additional information can be obtained from:

Dr. Clark R. Wilson, Code YS
National Aeronautics and Space Administration
Washington, DC 20546-0001
202-358-0273 (Fax -2770) cwilson@hq.nasa.gov

Your interest and cooperation in participating in this effort are appreciated.

W. F. Townsend

Acting Associate Administrator, Office of Mission to Planet Earth

LIST OF APPENDICES:

APPENDIX A: Solid Earth and Natural Hazards Research and Applications Priorities
APPENDIX B: Supporting Facilities and Data Archives
APPENDIX C: Guidelines for Preparation of Proposals in Response Specifically to **NRA**

97-MTPE-10

- APPENDIX D: Instructions for Preparation of Proposals Submitted in Response to NASA Research Announcements
- APPENDIX E: Formats and Forms for Proposals Submitted in Response to this NASA Research Announcement

APPENDIX A.

SOLID EARTH AND NATURAL HAZARDS RESEARCH AND APPLICATIONS PRIORITIES

Introduction

This announcement presents an opportunity for researchers to participate in the National Aeronautics and Space Administration (NASA) research and development themes of Solid Earth and Natural Hazards Research and Applications. The research themes aim to develop and apply NASA space geodetic and remote sensing technology in the solution of important scientific problems which improve our understanding of the dynamics of the solid earth (including the interaction with atmosphere, ocean and fluid core) and which demonstrate or disseminate this technology in ways that are important to society, especially in the assessment and mitigation of natural hazards.

This NASA Research Announcement (NRA) will serve as the vehicle for soliciting research in areas of Solid Earth, Natural Hazards, and Geologic Applications and the development of supporting technology. We anticipate that the Solid Earth and Natural Hazards research and applications areas in NASA will issue a modified version of this solicitation annually, which will include flight project science team opportunities as well, when appropriate. A summary of currently supported research projects may be found at the following web site: (<http://www.hq.nasa.gov/office/mtpe/nraselections.html>).

The Solid Earth and Natural Hazards (SENH) Programs actively collaborate with partners around the world. Some fifty countries and over eighty-five domestic and international agencies participate in satellite tracking, measurements and experiments coordinated by our programs. As a result of the previous NRA, SENH joint research activities with the USGS, NOAA, NSF, EPA and FEMA were selected, along with collaborative proposals involving working groups and agencies in Asia, Europe, Australia, and the Americas. When joint-agency participation is appropriate, proposers should submit the same proposal to each agency, and copies of relevant task statements and budget pages for each. In research areas where other Federal agencies have major operational responsibilities, joint-agency sponsorship or participation is expected in the development of a viable proposal. Proposals which seek support of the University NAVSTAR Consortium (UNAVCO) in GPS work must include a copy of the UNAVCO support request sheet, found in Appendix E, as part of their budget. International response to this solicitation is encouraged on a no-funds-exchanged basis (see Appendix C). U. S. investigators wishing to participate in international projects in which NASA is a participant such as the Working Group of European Geoscientists for the Establishment of Networks for Earthquake Research (WEGENER) or the Asia Pacific Space Geodynamics (APSG) should respond to this solicitation if NASA support is desired.

The main criteria for selection are: meritorious science, uniqueness to NASA (that is, involving effective use of NASA or other space- or air-borne data sets), contributions to the research priorities of this NRA, cost effectiveness, technical and logistical feasibility, and federal administration policy relevance. With the exception of a limited number of exploratory pilot programs and individual proposals of exceptional merit, most selected activities must also contribute to current Mission to Planet Earth priorities, as described in the Science Plan found through the Mission to Planet Earth Home Page (see Appendix B). Proposals which seek support for improved techniques, instrumentation, facilities, software, or the production or refinement of

data sets, should do so within the context of addressing a scientific issue within the areas outlined below.

Solid Earth and Natural Hazards Priorities Emphasized in this Solicitation

I. Dynamics of the Solid Earth.

NASA continues to develop satellite missions, technologies and analytical techniques to improve understanding of the dynamics of the solid Earth, including studies of the gravity field, rotational variations, magnetic field, and related problems of defining and maintaining an accurate and stable terrestrial reference frame. Resources for such studies are described in Appendix B and include data from various satellite missions, airborne observations, and global ground-based space geodetic observations such as Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR) and Global Positioning System (GPS) networks. The paragraphs below outline specific research areas.

1. Static and Time Variable Gravity Studies:

NASA continues to invest in the development of improved gravity observations, and has recently selected the GRACE (Gravity Recovery And Climate Experiment) mission for development and launch in 2001. GRACE will be capable of producing complete high resolution gravity field models at spherical harmonic degree and order exceeding 100, every few weeks. The accuracy of the GRACE field models should permit the observation of changes in surface loads of better than a centimeter of water (or millibar of air) with spatial dimensions of the order of a thousand kilometers. Prior to the launch of GRACE, static and time variable gravity field information is also available from TOPEX/ Poseidon and other radar altimetry satellites, laser tracking of geodetic satellites such as the Laser GEodynamics Satellite (LAGEOS) I, II, on-board GPS and other tracking of low Earth orbiting satellites, and surface measurements.

Because temporal changes in the gravity field measure mass flux in the atmosphere, oceans, cryosphere, solid Earth and its core, investigations of gravity are intimately related with those of Earth Orientation and Reference Frames (Section 2, below). Furthermore, both gravity and earth orientation information complement observations about these mass fluxes that are obtained by other methods. In response to previous NASA NRA's a number of investigations are currently supported which relate to determining causes of the time variable gravity field. We seek only a few new investigations in this area, but particularly those which can serve as pilot studies in preparation for the GRACE mission, aiming to develop methods for translating time variable gravity observations into useful estimates of climate-related quantities such as variations in water stored in and transported to and from ice caps and the continents.

2. Earth Orientation, Reference Frames, Angular Momentum of Earth Systems:

Earth orientation (including length of day, polar motion, precession and nutation, and geocenter location) is a fundamental description of the Earth and provides a measure of change within the Earth system over all observable time scales. Changes in Earth orientation result from transport and redistribution of mass within the atmosphere, hydrosphere, cryosphere, and solid earth and core. NASA-supported research has demonstrated that earth orientation measurements by VLBI, SLR, and GPS provide a means to evaluate atmospheric general circulation models (GCM's), to understand weather and climate changes (e.g., El Nino/Southern Oscillation, the quasi-biennial oscillation, and the 40-50 day oscillations) and to measure the global ocean tides. Definition of an accurate

terrestrial reference frame requires that atmospheric, oceanic, core and other contributions to earth orientation variations be well understood.

In response to previous NASA NRA's, a number of investigations are currently supported in this area. Thus, we anticipate supporting only a few new efforts, but particularly those which are coordinated with activities of the International Earth Rotation Service (IERS). Institutions proposing to be IERS coordinating centers for geophysical fluids (<http://hpiers.obspm.fr/iers/info/gazette.14>) should also submit their proposals to this NRA, with very modest budget plans to provide for the incremental costs of serving as an IERS coordinating center. To be considered for support from NASA, IERS coordinating center proposals must be accepted by the IERS, and be clearly related to currently supported investigations, or contained as part of a proposed effort submitted in response to this NRA.

3. Geomagnetism:

A number of geomagnetic satellite missions are planned for launch beginning in early 1998 through the end of the 1990's (See Appendix B). These missions will provide nearly global coverage with both vector and total field instruments at altitudes low enough to investigate crustal as well as main and external field sources. Most of the missions will carry dual-frequency GPS receivers, which enable precise orbit determination and atmospheric occultation observations. Investigations which use these satellite-based GPS and geomagnetic observations, possibly in conjunction with other satellite and ground-based observations, are sought via this announcement. Proposals may include such topics as improved understanding and description of: the main field, its sources, and temporal variations; near-surface field sources; external fields and their temporal variations, and estimates of the Earth's electrical conductivity structure. Investigators who have been previously funded under Oersted and other geomagnetic initiatives should prepare new proposals in response to this announcement, including a description of accomplishments achieved with prior support.

II. Topography & Surface Change:

NASA is continuing the development of space-based capabilities to measure at high resolution and accuracy the Earth's surface topography and to detect minute changes in this surface using GPS, Interferometric Synthetic Aperture Radar (INSAR), laser altimetry, and other remote sensing techniques. A Space-Shuttle-Based interferometric synthetic aperture radar mission, the Shuttle Radar Topography Mission (SRTM), is under development and scheduled for launch in 1999. SRTM will provide an unprecedented, high-resolution digital terrain model within a common GPS coordinate system for most land areas on earth. Scientific applications of SRTM data and other topographic data will be sought in next year's NRA.

1. GPS and INSAR Applications

Studies using GPS campaigns: During the period 1992-1996, NASA supported a number of GPS field campaigns within the Dynamics of the Solid Earth (DOSE) Program to measure deformation at plate boundaries and other areas of seismic risk in order to improve understanding of the physical processes related to earthquake hazards. As a result of the DOSE effort, GPS campaign techniques have been advanced, and GPS campaigns are now widely used in the scientific community. Although NASA seeks to continue this technology improvement, given the mature state of the art, we anticipate that few additional proposals for field-campaign-style investigations will be selected. Proposals involving

GPS field campaigns must show exceptional promise both of addressing important scientific problems (related to crustal deformation or natural hazard assessment), and of significantly advancing the technology of GPS measurements. Proposals in this category which anticipate the use of UNAVCO resources for GPS field activities must include a 'UNAVCO requirements' sheet as part of their budget, as given in Appendix E. UNAVCO support expenses are budgeted separately by NASA but are considered in deciding the overall cost-effectiveness of the proposal.

Studies with permanent GPS arrays: NASA continues to play a leading role in the development of the International GPS Service for Geodynamics (IGS) global network and the Southern California Integrated Geodetic Network (SCIGN), operated under the aegis of the NSF-Southern California Earthquake Center. See Appendix B. NASA encourages the exploitation of the IGS global network, the Southern California Integrated GPS Network (SCIGN), and other permanent GPS network data (in the US and overseas) for tectonic and natural hazard studies. The integration of GPS array data with interferometric SAR (INSAR), and other remote sensing tools is encouraged within regions of existing permanent GPS arrays. NASA has no current plans to support the installation of additional permanent GPS arrays until the effectiveness of the SCIGN array is assessed, over the next few years. However, a limited number of new IGS global network stations may be considered for installation over the next few years. Proposals may include recommendations for new IGS permanent stations as part of a planned scientific effort. In this case, a short justification letter should be included, with a copy sent to the IGS Central Bureau. In addition, a UNAVCO requirements sheet for a proposed new IGS station must be included as part of the proposal budget. The cost of procuring and maintaining IGS stations is funded separately by NASA but is considered in deciding the overall cost-effectiveness of the proposal.

2. Characterization of Sea Level Change:

Geodetic control of tide gauges: It is clear that although satellite altimetry is an important means of monitoring global sea level now and will continue to be in the future, a well-understood network of global tide gauges will continue to be necessary both for altimeter calibration and to establish a connection with the historical record. NASA has helped support studies and workshops along with other Federal agencies and international groups such as the Global Level of the Sea Surface (GLOSS) to develop plans for use of tide gauges to perform altimeter calibration and to monitor long term sea level change. Investigators seeking support in this area should review related information described in Appendix B. Support will be available for a very limited number of new investigations which develop methodologies for geodetic control at an existing tide gauge or gauges with a long history of observations. Support for related altimeter calibration efforts will also be considered. The research issues of particular interest are: devising effective GPS and other observing strategies, improving the quality of vertical position estimates, using existing resources such as CORS, and estimation of tectonic, post glacial rebound, and human-related influences. The emphasis in such investigations should be in the development of improved space geodetic methodology, rather than in the implementation of geodetic control over tide gauge arrays. Proposed investigations which require permanent instrumentation at tide gauges should involve close coordination with the relevant operational agencies (such as NOAA).

3. Coastal Hazards:

The near-shore coastal environment is subject to geologic, ecologic, oceanographic and meteorologic factors which can lead to extreme storm surges, regional subsidence, flooding, erosion, and regional bathymetric changes due to sediment redistribution/resuspension. Although coastal erosion is the biggest long-term threat to property values, development of the coastal region has greatly increased in recent decades.

NASA seeks to establish a few pilot studies to develop time series of observations of coastal configuration for purposes of assessing risk and evaluating effects of seasonal and extreme storms, and to assess the potential effects of sea level change on the coastal environment. Proposals in this category should utilize NASA's or other remote sensing techniques to acquire baseline precision topographic, bathymetric, meteorologic, climatologic, and other observational data sets. We encourage the formation of teams of investigators, including operational agencies at various levels, to design a measurement and analysis time series observation and analysis program around several key high risk, highly dynamic regions of US coastal locations.

4. Hazardous Consequences of Short-Term Climate Variability

This research announcement invites proposals to study the hazardous and potentially disastrous effects of short-term climate variability. These effects may be manifested in increased rates and severity of floods, storms, and droughts. Proposals are solicited which seek to explain, predict, and/or verify relationships between short-term climate fluctuations and these phenomenon. The goal is to develop tools for assessment of near-term vulnerability to such disasters. Prediction and understanding of climate variability at seasonal and interannual time scales is a goal of other Mission to Planet Earth programs.

5. Flood Disaster Management Applications

Flood disaster management applications continue to be an important component of the Solid Earth and Natural Hazards Program. We are particularly interested in studies that address the use and limitations of remote sensing observations and model development for the assessment of flood risk and flood mitigation, and retrospective analyses of previous flood events. Beginning this fiscal year, activities in this area will be joint with the NASA Land Surface Hydrology Program. Proposers interested in responding to this section of the NRA should submit their proposals to the Land Surface Hydrology Program NRA that is to be released in approximately two months.

6. Topography and Surface Change Science Team:

In response to a NASA research solicitation in 1995 a science team was selected to pursue investigations in topography and surface change and relationships with traditional fields of hydrology, ecology, glaciology, geology, geodynamics, natural hazards, modeling and technique development. This team has provided a forum for information transfer and recommendations on data requirements for future airborne/spaceborne observations of topography and its changes. Investigators from this science team may propose to other parts of this solicitation, or may propose to extend their current project for one year, but we anticipate that only a few of these proposals will be supported. One year extension proposals should be no longer than 5 pages, including budget information, and should carefully justify the requirements for additional funds to conclude their existing project. Otherwise, currently-supported investigators on the Topography and Surface Change

science may wish to delay submission of a new topographic science proposal until next year's NRA, which is planned to include a call for analysis of the SRTM data.

III. Thermal and Geothermal Hazards:

1. Wildfires:

A team of investigators in this research area was selected under the previous NRA (96 MTPE-05), and there are no plans to support new investigations at this time.

2. Volcanic Hazards:

New capabilities to monitor eruption precursory activity at a volcano are under development. Following the previous NRA, (96 MTPE-05) several investigations were selected relating to satellite-based capabilities to detect centimeter-scale deformation of a volcano through INSAR and GPS techniques, or to utilize remote sensing observations to monitor thermal and gas emissions. In addition, NASA helps support a study team for volcano monitoring technologies through UNAVCO. An important theme in the investigations selected under the previous NRA is the development of low cost monitoring techniques for pre-eruptive hazard assessment, and next year's NRA is planned to include a call for proposals to implement these technologies. Therefore, this year's research announcement solicits proposals in complementary areas, especially in areas such as co- and post-eruptive hazard assessment and monitoring methodology involving the use of space technology and remote sensing.

IV. Geologic and Archeologic Applications of Remote Sensing

Remote sensing technology has progressed to advanced levels of practical application, particularly in the areas of visible/infrared imaging spectrometry, multispectral thermal imaging, imaging radar, topographic measurements, and high-resolution geopotential fields measurements. For example, calibrated imaging spectrometer data measure the full visible and near infrared spectrum and can be utilized not only to map in detail the stratigraphy of test sites but also can be used to identify the constituent minerals and their lateral variability within stratigraphic units. Multiparameter imaging radar can be used to derive quantitative estimates of surface roughness and soil moisture under certain conditions, and interferometric radar and laser altimeters can be used to measure and monitor minute changes in the topographic surface.

NASA is particularly interested in fostering the development of geologic applications such as resource exploration, environmental monitoring and protection, and hydrogeology. Our goal is to develop applications that would advance the mission of industry or applications-oriented and/or regulatory agencies as a whole rather than focus on individual science projects. In response to previous NASA NRA's, a number of investigations are currently supported in this area. Thus, we anticipate supporting only a few new activities in this area. These proposals must utilize NASA's advanced observational technology (see appendix B) and stimulate further development/refinement of methodologies, algorithms and models for data analysis and information extraction, calibration, or integration with other data types for geological research. Partnership between research scientists and scientists in applications-oriented companies/agencies is required. In addition, operation needs must be clearly identified and a plan for turning the research results into an operational or routine application must be included.

This NRA also anticipates supporting a few high-quality investigations which make use of remote sensing data in archeological studies. These proposals should focus on the use of existing data sets (see Appendix B) to investigate the existence of early civilizations and be coordinated with internationally based archeological organizations, societies, or programs which seek to increase their understanding of and exposure to remote sensing observational technology and techniques.

APPENDIX B. SUPPORTING FACILITIES AND DATA ARCHIVES

NASA Resources

An overall view of NASA resources and world wide web links to NASA centers and data archives is the web site:

<http://www.nasa.gov/>

1. Space Geodetic Networks and Data Resources

FLINN

Fiducial Laboratories for an International Natural Science Network , (see "Solid Earth Science in the 1990s, Volume 1--Program Plan", NASA TM 4267, Vol 1. February 1991) was proposed as a global network of space geodetic stations with approximately 2000 km spacing integrating Global Positioning System (GPS), Very Long Baseline Interferometry (VLBI), and Satellite Laser Ranging (SLR) technology to support Earth studies. The realization of the FLINN concept remains the unifying element in space geodetic ground stations through the efforts of NASA and a variety of national and international partners. The data available from the global network of stations is described in further detail in the websites listed below Data include high accuracy low earth orbiter and GPS satellite ephemerides, earth rotation parameters, coordinates and velocities of the tracking stations, and GPS satellite and tracking station clock information.

International GPS Service for Geodynamics

The IGS provides the global tracking network for the GPS constellation and associated data products. Further information can be found at the following website:

<http://igsjb.jpl.nasa.gov/>.

Crustal Dynamics Data Information Service

An important resource for geodetic data is the Crustal Dynamics Data Information service. Data are available for all the major space geodetic techniques. This site contains information on geodetic networks such as CORS, gravity field models, and links to many other data resources

http://cddis.gsfc.nasa.gov/920_1/sgapo.html.

<http://cddis.gsfc.nasa.gov/cddis.html>

VLBI Observation Programs (CORE)

Future Plans for the VLBI observing program and science rationale may be found at the following locations:

<http://lupus.gsfc.nasa.gov/vlbi.html>

Southern California Integrated Geodetic Array (SCIGN)

The Southern California Integrated Geodetic Array (SCIGN) provides a dense geodetic network for the study of crustal deformation in the Los Angeles Basin and vicinity. NASA in collaboration with NSF, the USGS, state and local organizations to develop SCIGN as a possible tool for the mitigation of natural hazards and the study of earth processes. The website is:

<http://milhouse.jpl.nasa.gov/>

Southern California Earthquake Center (SCEC)

The southern California Earthquake Center (SCEC) provides seismic data resources complementary to the geodetic data of SCIGN. Websites include:

<http://www.usc.edu/dept/earth/quake/scecfac/index.shtml>

<http://www.scecdc.scec.org/>

Other Permanent GPS Arrays

Another GPS array in place in the San Francisco Bay area is described at the following website

<http://quake.wr.usgs.gov/QUAKES/geodetic/bard/>

<http://quake.geo.berkeley.edu/ncedc/ncedc.access.html>

UNAVCO

Resources supporting GPS field and permanent sites are provided by UNAVCO, a consortium of universities and institutions with NSF and NASA support. Consultation with UNAVCO personnel is encouraged if there are questions concerning arrangements for field or permanent GPS installations.

http://www.unavco.ucar.edu/gen_info/

http://www.unavco.ucar.edu/gen_info/related_web.html

Global Level of the Sea Surface (GLOSS)

An international effort to identify tide gauge networks for long term sea level and altimetry calibration studies has been organized under the GLOSS initiative. Further information is found at the website:

<http://www.nbi.ac.uk/psmsl/gloss.info.html>

International Earth Rotation Service (IERS)

The IERS coordinates the monitoring of the rotation of the earth, provides organization for the techniques of space geodesy, and conducts campaigns to monitor geophysical fluids and new types of analysis. Important websites include:

International Earth Rotation Service Geocenter Campaign <http://maia.usno.navy.mil/geoc.html>

Call for Geophysical Fluids Coordinating Centers <http://hpiers.obspm.fr/iers/info/gazette.14>

IERS General Information <http://hpiers.obspm.fr/>

2. Airborne Instrumentation Resources

The Mission to Planet Earth Airborne Sciences program is undergoing significant changes in response to consolidation efforts. Current inform may be obtained from the NASA Airborne Science Home Page URL:

<http://airsci-www.arc.nasa.gov/SciPrg/home.htm>

Two Lockheed ER-2 (U-2R,) a DC-8, and P-3B form the core fleet and provide multi-level platforms for both NASA- and investigator-owned sensors. Outsourcing requirements will provide a variety of additional platforms to meet observational needs, such as the Las Vegas-based Citation operated by the DOE. These aircraft are used as test-beds for advanced sensor design and satellite simulation, as well as to support scientific and other operational data collection campaigns. Various sensor systems are in use and under development, including seven different multispectral imaging devices, a SAR system, Laser Altimeters, and a suite of large-format mapping cameras. The aircraft are equipped with GPS location systems, and continuously record position and platform attitude information inflight. All instruments are spectrally, spatially, and radiometrically calibrated on a routine basis. To request flights of the NASA aircraft and or use of NASA instrumentation, a Flight Request form is required. These forms are available from the Ames Research Center, ATTN: Aircraft Programs, MS 211-17, Moffett Field CA, 94035-1000, phone 415-604-6099 (-1750 fax) or are available on line at the above WWW URL.

AIRSAR/TOPSAR

The Airborne Synthetic Aperture Radar (AIRSAR) is an imaging radar instrument mounted on a NASA DC-8 aircraft. AIRSAR uses three microwave frequencies: P-band (68-cm wavelength), L-band (25-cm wavelength) and C-band (6-cm wavelength). AIRSAR serves both as a research tool for the development of new radar remote sensing techniques, and as a facility instrument for gathering radar data in support of scientific research programs conducted by investigators selected by NASA. AIRSAR operates in two modes: POLSAR, for fully polarimetric (4 polarizations HH, HV, VV, VH) data at each frequency; and TOPSAR, for cross-track interferometric data at C and L band frequencies to rapidly produce topographic maps of Earth. For more information see the following websites:

<http://southport.jpl.nasa.gov/airsar/> and
<http://southport.jpl.nasa.gov/airsar/topsar/>.

AVIRIS

The Airborne Visible Infrared Imaging Spectrometer (AVIRIS) is an instrument that operates onboard a NASA ER-2 aircraft. The instrument is a unique optical sensor that images in 224 contiguous spectral channels, or bands, in wavelengths from the infrared (400 nanometers) to the ultraviolet (2500 nanometers); therefore, a continuous, diagnostic spectral reflectance curve can be reconstructed for each picture element in a scene. Its science objectives are to study Earth's ecology, geology, snow hydrology and oceanography to achieve an understanding of the environment and global climate change. For more information, the website is:

<ftp://ophelia.jpl.nasa.gov/pub/docs/html/top.htm/>.

TIMS

The Thermal Infrared Multispectral Scanner (TIMS) has six spectral channels between 8 and 12 micrometers (um). The earth's atmosphere is fairly transparent in between 8 and 12 um, although water vapor, ozone, and sulfur dioxide are strong absorbing (and emitting) gases in this spectral region. The centers of the six TIMS channels (as of June, 1994) are 8.457, 8.795, 9.228, 9.917, 10.796, and 11.753 um. TIMS has an IFOV of 2.5 milliradians (mr), producing data with a spatial resolution of 5 m when flown 2 km above the ground. The radiance measurements are digitized into 8 bit (256 DN) pixels. TIMS data have been applied to a variety of geologic mapping projects, since carbonate, sulfate, and silicate minerals have distinctive spectral signatures in the thermal

infrared. More recently, TIMS data have been applied to mapping geothermal anomalies and SO₂ plumes in volcanic terranes.

TMS

A widely used digital multispectral scanner flown aboard the ER-2 is the Daedalus Thematic Mapper Simulator (TMS). Simulating the performance of the Thematic Mappers (TM) orbiting on Landsat 4 and 5 satellites, it replicates the spatial and spectral characteristics of the seven bands of digital data acquired by the Thematic Mapper. Four additional spectral bands are also acquired by the TMS while TM band 6 (thermal data) is acquired at full resolution in two channels in low and high gain settings. The TMS has provided data for land use and land cover analysis, forestry applications, geologic studies and disaster assessments.

LASER ALTIMETERS

Three laser altimeter sensors developed at the Goddard Space Flight Center (GSFC) for airborne measurement of Earth surface topography are available. The RASter Scanning Airborne Lidar (RASCAL), Scanning Lidar Imager of Canopies by Echo Recovery (SLICER), and the Airborne Topography Mapper (ATM) provide complementary elevation measurement capabilities that are geolocated and referenced to an absolute elevation datum by combining laser ranging data with precise knowledge of aircraft position and laser pointing attitude. RASCAL and ATM acquire a swath of high resolution, high accuracy elevation measurements by pulse time-of-flight ranging using a high-repetition-rate laser. Nominal configuration provides a 200 m swath width of 100 laser footprints from a 1 km aircraft altitude above terrain. At the 1 km altitude the laser altimeter sensor precision of ~ 10 cm. SLICER acquires a narrow swath of larger laser footprints and combines time-of-flight ranging with waveform digitization of return pulse echoes using a high-energy laser. The waveform signal from large footprints provides a means to measure ground elevations beneath dense canopies with moderate (meter-level) vertical accuracies. The waveform records the area-weighted height distribution of all reflecting elements within a footprint, including canopy elements and the underlying ground. Consistent recovery of vegetation height and ground elevations, from the waveform first and last returns, has been demonstrated for canopies with closures as dense as 95% when the footprints are sufficiently large to encompass full tree crowns and significant areas of exposed ground (e.g. greater than or equal to 10 meter diameter footprints). Elevation accuracies of several meters or better, depending on surface slope conditions, can be achieved. For more information, contact David Harding at Goddard Space Flight Center (301-286-4849)

MAS

The MODIS Airborne Simulator (MAS) is a modified Daedalus multispectral scanner configured to approximate the Moderate-Resolution Imaging Spectrometer (MODIS), an Earth Observing System (EOS) imaging spectrometer scheduled for orbit in the late 1990s. MODIS is designed to acquire digital imagery for, measuring earth biological and physical processes and atmospheric properties. MAS records fifty channels of sixteen bit data in the visible, near infrared, mid-infrared and thermal portions of the spectrum. Channels include 9 bands from 0.529 - 0.969 micron, 16 bands from 1.595 - 2.405, 15 bands from 2.925 - 5.325 , and 9 bands from 8.342 -14.521 microns. The MAS has a 2.5 mr instantaneous field of view, and when flown at 65,000 feet on the NASA ER-2 aircraft produces images with approximately 50 meter spatial resolution.

3. Satellite Systems Resources

TOPEX/POSEIDON

NASA-JPL's Ocean Topography Experiment/Poseidon (France's Poseidon mission) satellite is the most sophisticated attempt yet to measure and map sea level from space. For more information, consult the web site

<http://topex-www.jpl.nasa.gov/>.

TOMS

The Total Ozone Mapping Spectrometer measures ozone indirectly by monitoring ultraviolet light. It has mapped in detail the Antarctic "ozone hole," which forms September through November of each year, and the distribution of ozone over the globe. In addition to ozone, TOMS measurements can also be used measure and track sulfur-dioxide in volcanic eruption plumes. NASA and the U.S. Federal Aviation Administration (FAA) are studying ways to use these measurements to detect volcanic ash clouds that are hazardous to commercial aviation. For more information, the website is:

<http://skye.gsfc.nasa.gov/>.

SIR-C/X-SAR

SIR-C/X-SAR is a joint project of the National Aeronautics and Space Administration (NASA), the German Space Agency (DARA) and the Italian Space Agency (ASI). SIR-C/X-SAR stands for Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar. The SIR-C instrument was built by JPL and the Ball Communication Systems Division for NASA and provides the L band and C-band measurements at four different polarizations. The L-band and C-band antennas employ phased array technology, which allows the antenna beam pointing to be adjusted electronically. The X-SAR instrument is built by the Dornier and Alenia Spazio companies for DARA and ASI and operates at a single frequency, X-band. SIR-C/X-SAR flew on the NASA Space Shuttle twice in April and October of 1994. Radar images generated by SIR-C/X-SAR are used by scientists to help understand some of the processes which affect the earth's environment, such as deforestation in the Amazon, desertification south of the Sahara, and soil moisture retention in the Mid-West, and natural hazards and are available at the JPL. For more information, the website is:

<http://southport.jpl.nasa.gov/>.

SHUTTLE LASER ALTIMETER

The Shuttle Laser Altimeter-01 (SLA) precisely measures the distance to the Earth's surface from the Space Shuttle. The SLA works by transmission of a series of short laser pulses from the payload in the Shuttle cargo bay and by the subsequent reception of the weak backscattered laser radiation to the payload. SLA-01 flew on the Space Shuttle in January, 1996, and SLA-02 will fly in August, 1997. Primary data on a laser pulse's time-of-flight and the spreading of the laser pulse by the Earth's surface and measureable backscatter from land surfaces, vegetation, ocean surfaces, and cloud-tops are available. These data have wide applications in a variety of Earth science disciplines ranging from topography studies to atmospheric remote sensing. For more information, view world wide web site

<http://denali.gsfc.nasa.gov/research/laser/sla/sla1.html>

4. GEOPOTENTIAL FIELD DATA SETS

NASA supports through its Geopotential Field Program the acquisition of geomagnetic and gravity data sets from space borne sensors and the synthesis of global gravity and magnetic compilations.

POGO-MAGSAT

The original Magsat data with merged ephemerides useful for main field modeling, and data sorted by magnetic disturbance levels, season, and local time are available on CD-ROM from the National Space Science Data Center. For crustal field studies a Magsat data set corrected for external fields is available on American Geophysical Union anonymous ftp (kosmos.agu.org) , including 1-degree gridded data sets available for three recently published anomaly maps: POGO, Magsat and combined POGO/Magsat. Field models for 1900 to 1995 are available, including 1st degree external fields, and a model for the POGO-Magsat epoch which includes the main field, low degree magnetospheric field, and the Sq field.

OERSTED

The Oersted magnetic observatory satellite is planned for launch in early 1998. The website is:

<http://gate.dmi.dk:8080/fsweb/Projects/oersted/>

SUNSAT

A South African satellite is planned to be launched with Oersted and will also carry a magnetometer and GPS receiver. More information can be obtained from the website:

(<http://sunsat.ee.sun.ac.za>)

Gravity Field Models

NASA has supported the development of gravity field compilations using combined surface and satellite observations including recent JGM-3 compilation to degree and order 70 and the soon to NIMA/GSFC combined satellite/surface gravity compilation EGM96 to degree and order 360 including 30 minute gravity anomalies. The results are available at the CDDIS, described above.

Geodetic Satellites

Data from a number of the geodetic satellites including LAGEOS 1 and LAGEOS 2 as well as a new series of low earth orbiting GPS receivers aboard the Oersted and Sunsat satellites are available from the CDDIS.

4. OTHER DATA RESOURCES

EOSDIS

The Earth Observing System Data and Information System (EOSDIS) is a comprehensive data and information system designed to perform a wide variety of functions in support of a national and international user community. EOSDIS will command and control satellites and instruments and will generate products from orbital observations as well as generate data sets from satellite and in situ observations into global climate models. Services provided by EOSDIS include: data archive, distribution and management; information management; product generation; spacecraft command and control; and data capture and telemetry processing. NASA is implementing EOSDIS using a distributed, open systems architecture. This approach allows for the allocation of EOSDIS elements to various locations to benefit from different institutional capabilities and scientific expertise. For more information, connect to the world wide web address

<http://spsosun.gsfc.nasa.gov/ESDIShome.html/>

ASF

The Alaska SAR Facility (ASF), located in the Geophysical Institute at the University of Alaska Fairbanks, downlinks, processes, archives, and distributes SAR data for NASA Investigators from the European Space Agency's ERS-1 and ERS-2 satellites, NASDA's JERS-1 satellite, and soon the Canadian Space Agency's RADARSAT satellite. Available SAR products include: full-resolution (25 m) images; low-resolution (240 m) images; complex-format SAR data products which retain amplitude and phase information; geocoded images; and uncorrelated (raw signal) SAR data, representing the original backscattered radar signals. ASF also archives GPS (Geophysical Processing System) products which input SAR data. The GPS archive currently includes ice motion, ice classification, and ocean wave spectra products. The Geo-Data center, a joint project between ASF and the Geophysical Institute, holds many complementary data sets, each covering Alaska and nearby regions. Their data holdings include LANDSAT, NOAA/AVHRR, and AHAP images as well as USGS maps. Detailed descriptions of all supported products are available. ASF is one of several Distributed Active Archive Centers (DAACs) sponsored by NASA as part of the Earth Observing System initiative. Contact ASF's User Services at phone number 907-474-6166 or email address uso@eosims.asf.alaska.edu or <http://www.asf.alaska.edu/index.html> for more information.

EROS Data Center DAAC

The Earth Resources Observation Systems (EROS) Data Center Distributed Active Archive Center (EDC DAAC) was established as part of NASA's Earth Observing System Data and Information System (EOSDIS) initiative to promote the interdisciplinary study and understanding of the integrated Earth system. Access to land processes data, including satellite- and aircraft-acquired data stored in the EDC DAAC's archives, plays an important role in promoting such study and understanding. Research performed by Earth and global change scientists investigating the conditions and processes that affect land-atmosphere and land-ocean interactions is supported by enhanced access to archived data and data products. Information about and procedures for obtaining these data are provided through the EOSDIS Information Management System. Further information is on the EOSDIS home page site

<http://edcwww.cr.usgs.gov/landdaac/landdaac.html>.

Appendix C. GUIDANCE NECESSARY FOR PREPARATION OF PROPOSALS IN RESPONSE TO NRA-97-MTPE-10

Proposals should be prepared in accordance with Appendix D, “Instructions for Responding to NASA Research Announcements”, except for the provisions identified below. In case of a conflict, the provisions below take precedence.

The full proposal (Research Objectives, Detailed Work Plan, Expected Results, Relevance of Proposed Work, Role of Personnel, Data Requirements, Supporting Facilities, and References (references may be single spaced) may be up to fifteen pages of text, double spaced, 12-pt. type, as described in full detail in Appendix E. In addition, each proposal must have a cover sheet signed by a responsible official or authorized representative of the organization, a single-page summary/abstract, and a listing of current and pending support (forms/formats for these pages are provided in Appendix E and must be utilized). The proposal format includes cover sheet, single-page summary/abstract, proposal body, resumes and listing of current and pending support, and detailed budget information. Up to two pages of additional figures and tables are specifically excluded from the 15-page limit.

The proposal must clearly identify the roles and responsibilities of the Principal Investigator, Co-Investigators, and collaborators for the proposed research. Only one proposal from the Principal Investigator should be submitted for collaborative efforts involving several institutions; Co-Investigator proposal copies will be returned. Generally, Co-Investigators are those who will make a critical or significant contribution to the proposed research and may (but are not required to) receive a portion of the funding if the proposal is selected. Evidence of commitment on behalf of the Co-investigator is required and may take the form of a letter from the Co-investigator or an authorized institutional official. Such evidence should be included in the budget section.

Also included in Appendix E are Certification forms: One completed form "Certification Regarding Debarment, Suspension, and Other Responsibility Matters Primary Covered Transactions" must be included with the original signature version of all proposals. Finally, any proposal requesting funding of \$100,000 or more must include a “Certification and disclosure regarding payments to influence certain federal transactions (4/91) ” signed by a responsible official or authorized representative (a copy is included in Appendix E). These forms are excluded from the 15-page limit.

Criteria for selection are outlined in Appendix D. Excepting exploratory pilot programs and individuals proposals of exceptional merit, most selected activities must also contribute to current Mission to Planet Earth and/or U.S. Global Change Research Program (USGCRP) priorities. Final decisions will be made promptly and investigators will be notified through both electronic mail and surface mail. All proposers who have submitted full proposals will receive anonymous copies of review comments from the mail reviewers. Regardless of the evaluation technique, the final decisions are always made by a designated NASA selection official incorporating the recommendations of the mail and/or panel reviews, and considerations related to funds available and to the overall balance of the Solid Earth and Natural Hazards Research and Applications programs.

Proposals will be considered for periods of performance from one to three years. It is NASA’s intention to fund some proposals for the full three year period of performance and to fund other proposals on a year-by-year basis. NASA anticipates being able to make approximately 10 to 40

new start awards with annual budgets in the \$50 K to \$200 K range. Proposers should budget to attend one investigator meeting each year, which will probably be conducted twice-yearly in conjunction with American Geophysical Union meetings.

GUIDELINES FOR FOREIGN PARTICIPATION

NASA accepts proposals from entities located outside the U. S. in response to this NRA. Proposals from non-U. S. entities should not include a cost plan. Non-U. S. proposals, and U. S. Proposals that include non-U. S. participation, must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the non-U. S. participant is proposing. Such endorsement should indicate the following points: (1) The proposal merits careful consideration by NASA; and (2) If the proposal is selected, sufficient funds will be made available by the sponsoring foreign agency to undertake the activity as proposed.

Proposals, along with the requested number of copies and Letter of Endorsement must be forwarded to NASA in time to arrive before the deadline established for this NRA. In addition, one copy of each of these documents should be sent to:

NASA Headquarters
Office of External Relations
Mission to Planet Earth Division
Mail Code IY
Washington, DC 20546
USA

Any materials sent by courier or express mail (e.g., Federal Express) should be sent to:

NASA Headquarters
Office of External Relations
Mission to Planet Earth Division
Mail Code IY
300 E Street, SW
Washington, DC 20024-3210

All proposals must be typewritten in English. All non-U. S. proposals will undergo the same evaluation and selection process as those originating in the U. S. Non-U. S. proposals and U. S. Proposals that include non-U. S. participation, must follow all other guidelines and requirements described in this NRA. Sponsoring non-U. S. agencies may, in exceptional situations, forward a proposal without endorsement to the above address, if review and endorsement are not possible before the announced closing date. In such cases, however, NASA's Mission To Planet Earth Division of the Office of External Relations should be advised when a decision on the endorsement is to be expected.

Successful and unsuccessful proposers will be contacted directly by the NASA Program Office coordinating the NRA. Copies of these letters will be sent to the sponsoring government agency.

Appendix D

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

(JANUARY 1997)

(a) General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR. Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each

proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) Transmittal Letter or Prefatory Material.

- (i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;
- (ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;
- (iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;
- (iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;
- (v) Identification of other organizations that are currently evaluating a proposal for the same efforts;
- (vi) Identification of the NRA, by number and title, to which the proposal is responding;
- (vii) Dollar amount requested, desired starting date, and duration of project;
- (viii) Date of submission; and
- (ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) Restriction on Use and Disclosure of Proposal Information. Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice

Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the

Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) Project Description.

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach.** For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) Facilities and Equipment.

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) Proposed Costs.

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(9) **Security.** Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support.** For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) Special Matters.

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) Renewal Proposals

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable

detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) Joint Proposals.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals.** A proposal or modification received after the date or dates specified in an NRA may be considered if doing so is in the best interests of the Government.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) Evaluation Factors

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award.**

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Cancellation of NRA.** NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

**Appendix E. FORMATS AND FORMS FOR PROPOSALS SUBMITTED
TO THE
SOLID EARTH AND NATURAL HAZARDS PROGRAMS**

FOLLOW DIRECTIONS CAREFULLY

**PROPOSALS MUST USE REQUIRED FORMATS AND SECTION NUMBERING AND
ADHERE TO ALL PAGE LIMITS**

**PROPOSALS WHICH DO NOT FOLLOW THE REQUIRED FORMATS WILL BE
RETURNED TO BE RE-SUBMITTED THE FOLLOWING YEAR**

Required Proposal Cover Sheet (Page 1)

(Copy this form or prepare a facsimile on a word processor if additional space is required for various items. Length must not exceed one page)

NASA Research Announcement 97-MTPE-10

Title: _____

Principal Investigator: _____

Department: _____

Institution name: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____ Country: _____

email: _____ Telephone: _____ Fax: _____

Co-Investigator(s):	Name	Institution	Telephone	email
	_____	_____	_____	_____
	_____	_____	_____	_____

Requested Starting Date _____ Type of Institution: _____

Budget: Year 1: _____ Year 2: _____ Year 3: _____ Total: _____

Other organizations to which this effort has been proposed: _____

Program Area: See Appendix A of NRA for details. Check no more than 2

- I. Dynamics of the Solid Earth
 - 1. Static and Time Variable Gravity Studies _____
 - 2. Earth Orientation, Reference Frames, Angular Momentum _____
 - 3. Geomagnetism _____
- II. Topography & Surface Change
 - 1. GPS and INSAR Applications _____
 - 2. Characterization of Sea Level Change _____
 - 3. Coastal Hazards _____
 - 4. Hazardous Consequences of Climate Variability _____
 - 6. Topography and Surface Change _____
- III. Thermal and Geothermal Hazards
 - 2. Volcanic Hazards _____
- IV. Geologic and Archeologic Applications _____

Signature of Principal Investigator: _____

Signature of Authorizing Official: _____

_____	_____	_____
(Name)	(Title and Institution)	(Date)

Required Proposal Summary (Page 2)

(Copy this form or prepare a facsimile on a word processor if additional space is required for various items. Length must not exceed one page)

NASA Research Announcement 97-MTPE-10

Title: _____

Principal Investigator: _____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____ Country: _____

email: _____ Telephone: _____ Fax: _____

Co-Investigator(s) Name	Institution	Telephone	email
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_____	_____	_____	_____
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_____	_____	_____	_____
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Budget: Year 1: _____ Year 2: _____ Year 3: _____ Total: _____

Proposal Summary (Single spaced), objectives and justification, prior accomplishments, proposed work and methodology.

Required Proposal Format

Page 1 Cover Sheet - Use form on Page E-2

Page 2 Proposal Summary - Use form on Page E-3

Pages 3 through 17 Proposal body and additional information with numbered sections and titles exactly as shown in capital letters below: Sections 1-8 must total no more than 15 pages double spaced using a 12 pt. font.

1. RESEARCH OBJECTIVES
2. RELEVANCE OF PROPOSED WORK
3. EXPECTED RESULTS
4. DETAILED WORK PLAN
5. ROLE OF PI, CO-I, COLLABORATORS AND OTHER PERSONNEL
6. DATA REQUIREMENTS
7. SUPPORTING FACILITIES
8. REFERENCES (may be single spaced)

Additional pages: Up to 2 additional pages containing figures with captions are permitted to follow the maximum 15 pages of the proposal body.

- 9A. PRINCIPAL INVESTIGATOR RESUME
(maximum of 2 pages, including at least 3 relevant publications).
PRINCIPAL INVESTIGATOR CURRENT AND PENDING SUPPORT
(for each grant or other source of support use the following format; separate each grant with a horizontal line; list current support first; include this proposal as the last item in the pending support list)
STATUS: (current or pending)
TITLE: (or short description if title is not informative)
SOURCE OF SUPPORT (Agency name)
PRINCIPAL INVESTIGATOR:
AWARD AMOUNT AND PERIOD OF PERFORMANCE:
PERSON-MONTHS OF SUPPORT: YR 1____ YR2 ____ YR3____
(support provided or proposed for this person in each year of the work period of this Solid Earth and Natural Hazards proposal)

- 9B, 9C, etc. Prepare a separate section for each co-investigator following the format for the Principal Investigator in Section 9A:
CO-INVESTIGATOR RESUME
CO-INVESTIGATOR CURRENT AND PENDING SUPPORT

10. DETAILED BUDGETARY INFORMATION AND EXPLANATIONS (Include UNAVCO support request sheet, using format on page E-7, collaborating institution statements and budget, if necessary) .

Attach Certifications to proposal copy bearing original signatures
(Use forms provided on pages E-5, E-6)

CERTIFICATION REGARDING DEBARMENT,
SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY
MATTERS (MAR 1996)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are * are not * presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have * have not *, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are * are not * presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has * has not *, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

Organization Name

PR/Award Number or Project Name

Name and Title of Authorized Representative

Signature

Date

CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE
CERTAIN FEDERAL TRANSACTIONS (APR 1991)

The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

Signature and Date

Name and Title of Authorized Representative

Organization Name

UNAVCO SUPPORT REQUEST FORM

The University Navstar Consortium (UNAVCO) Boulder Facility has been formally supporting NASA investigators in the use of Global Positioning System (GPS) equipment and technology for Earth studies since the early 1990's. UNAVCO will continue supporting investigators under the Solid Earth and Natural Hazards Research and Applications Program. The Boulder Facility provides to NASA grantees GPS equipment for episodic and continuous GPS measurements, engineering support for in-field measurements, technical consulting support for data collection, communications and management, data archiving support, and training and technology transfer as required by individual projects using GPS. In order to determine more accurately the scope and costs of this support role for individual NASA projects, any investigator requiring GPS support from the UNAVCO Boulder Facility is required to submit with their proposal in a summary the following information. Use the following numbered sections and keep the total length less than 2 pages. Single spacing may be used if necessary.

1. Principal Investigator Name, Institution and Contact Information.
2. List of Collaborators and Their Responsibilities with Emphasis on In-country Collaborators for Non-U.S. Projects.
3. Brief Discussion of Intended Science Goals and Preferred Style of GPS Data Collection, e.g. Episodic, Continuous, Real Time Kinematic, etc., Including Required Measurement Precision. Include Requirements for Any Associated Data Measurements, e.g. Meteorological, Tilt Meter, Seismic, Gravity, etc.
4. Approximate Dates and Location of Data Collection Activity Including Desired Density of Episodic Measurements, Number and Location of Permanent Stations, Methods of Mixing Continuous and Episodic Measurements, etc.
5. Equipment Requirements Including Short-term, Long-term, and/or Permanent Loan of Receivers, Antennas, Communications Equipment, Data Download Computers, Solar Panels, Monuments, Equipment Housing, Tripods, Tribrachs, etc. (See <http://www.unavco.ucar.edu> for sample equipment lists and budgets).
6. Requirement for Field Engineer Support Including Nature, Location and Time Frame of Support, Special Language Requirements, Special In-country Experience Requirements, Need for On-site Training of Project Personnel, Concerns About In-country Security and Safety Considerations for Project Staff, etc.
7. Any Known Special Hardware or Software Development Requirements, e.g. Data Translators for Special Receiver Types, Data Download Scripts for Special Download Platforms and Operating Systems, Special Monumentation Requirements, Special Power Requirements, etc.
8. Special Training and Technology Transfer Requirements, Especially for Foreign In-country Collaborators Including Preference for Training at the Boulder Facility vs. In-country Training.
9. Potential Means for Data Communications from Continuous Stations Back to Home Institution, UNAVCO Boulder, and/or the Crustal Dynamics Data Information Service (CDDIS), e.g. Internet Connection, Phone Modems, Manual Download and Mail Delivery, etc.
10. Requirement for Long-term Maintenance and On-site Support of Permanent Stations. Specify In-country Collaborator Role/Responsibility Related to Station Support.
11. Data Archiving Plan, Including Providing Access to Near Real Time Continuous GPS Measurements. Investigator responses to these questions will be used by the Solid Earth and Natural Hazards Program Office for determining the appropriate level of UNAVCO support for individual projects as part of the award decision for individual grants. Complete information will assure a better and more complete evaluation of the necessity and cost-effectiveness of specific support requests. END